# Anatomy of the pancreas and spleen

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## Abstract

The pancreas is a large, retroperitoneal organ situated immediately behind the posterior wall of the lesser sac, in the floor of the supracolic compartment of the abdominal cavity. Although principally an exocrine gland, the pancreas also performs crucially important endocrine functions. The exocrine pancreas secretes digestive enzymes. These are produced by the pancreatic acini and released into an elaborate ductal system which eventually opens into the second part of the duodenum. The endocrine component of the pancreas is represented by the islets of Langerhans that are present diffusely in the pancreatic substance. The islets are microscopic collections of cells whose secretions include pro-insulin and glucagon; hormones of vital importance in carbohydrate metabolism. Its deep location and its close topographical relationship to several vital structures make pancreatic surgery both challenging and hazardous. A sound appreciation of the topographical, vascular and ductal anatomy of the pancreas is fundamental to the successful surgical management of pancreatic cancers, congenital malformations of the pancreas and various surgical complications of acute pancreatitis.

The spleen is the largest lymphoid organ in the body. It is situated deep in the left hypochondrium, wedged between the gastric fundus, left hemidiaphragm and left kidney. Trauma, lymphoid neoplasia, gastric cancers, portal hypertension and idiopathic thrombocytopenia may necessitate splenectomy. A sound knowledge of the surgical and functional anatomy of the spleen is essential if splenectomy is to be performed safely and effectively.


**Keywords** Islets of Langerhans; lesser sac; pancreatic ducts; portal vein; splenic artery and vein; splenic hilum

## The pancreas

The pancreas is an elongated, soft, flat, lobulated and yellowish gland that lies on the posterior abdominal wall, more-or-less transversely. It is a retroperitoneal structure and possesses a thin capsule. For descriptive purposes the pancreas is divided into a head, neck, body and tail. The head and tail mark the right and left extremities of the gland, respectively (Figure 1). The head and neck of the pancreas lie slightly to the right of the midline while the tail is to the left of the midline. The body of the pancreas passes to the left, inclining slightly upwards to become continuous with the tail. As it passes from right to left, the body of the pancreas arches across in front of the aorta and vertebral column, approximately in the transpyloric plane at the level of the first lumbar vertebra. The deep location of the pancreas and the presence of various anteriorly-situated viscera render the pancreas inaccessible to physical examination. The pancreas has a dual function. Besides being an important, accessory, exocrine digestive gland, the pancreas possesses an important endocrine component made up of the million or so islets of Langerhans that are distributed throughout the substance of the pancreas.

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### Topographical relations of the pancreas

The head of the pancreas is the broadest part of the pancreas and lies snugly within the C-curve of the duodenum. Superomedially the head is continuous with the neck of the pancreas which in turn is continuous with the body. Projecting inferomedially from the head is the uncinate process. The latter insinuates itself behind the superior mesenteric vessels as the latter descend obliquely behind the body and neck of the pancreas into the mesenteric root (Figure 1). The structures related to the anterior aspect of the pancreas are as follows.

The root of the transverse mesocolon has a continuous attachment to the ventral surface of the head and neck of the pancreas and along the anterior surface of the body of the pancreas adjacent to its lower border. Superior to the line of attachment of the transverse mesocolon, the lesser sac is an immediate anterior relation of the pancreas. The lesser sac lies between the pancreas and the posterior surface of the stomach.

The posterior relations of the pancreas (Figure 1), moving from right to left, are as follows:

The head of the pancreas overlies the inferior vena cava which at this level receives the right and left renal veins. Immediately behind the head of the pancreas is the lower end of the common bile duct before the latter tunnels into the head of the pancreas to join the main pancreatic duct. The neck of the pancreas lies immediately in front of the commencement of the portal vein which is formed by the union of the splenic and superior mesenteric veins (Figure 1). The body of the pancreas, immediately medial to the neck overlies the abdominal aorta and the origin of the superior mesenteric artery. Further to the left the body overlies the left crus of the diaphragm, the left renal hilum and left suprarenal gland (Figure 1). The splenic vein runs immediately posterior to the length of the body of the pancreas and receives the inferior mesenteric vein 2–3 cm before joining the superior mesenteric vein (see Figure 3). Just lateral to the left renal hilum the tail of the pancreas extends into the lienorenal ligament.

### Arterial supply, venous drainage and lymphatic drainage of the pancreas

The head and neck of the pancreas are supplied by two pancreatico-duodenal arterial arcades; one anterior and one posterior (Figure 2). Each arcade is fed by the superior and inferior pancreaticoduodenal arteries. The arcades lie between the convex periphery of the pancreatic head and the concave inner margin of the duodenum. The superior pancreaticoduodenal arteries are branches of the gastroduodenal artery which in turn is a branch of the common hepatic artery. The inferior pancreatico-duodenal arteries are the earliest branches of the superior mesenteric artery. The pancreaticoduodenal arcades thus represent anastomoses between the coeliac and superior mesenteric arteries. As implied in their names, the pancreaticoduodenal arcades also supply the adjacent duodenum. Ligation or interruption of the arcades will result in

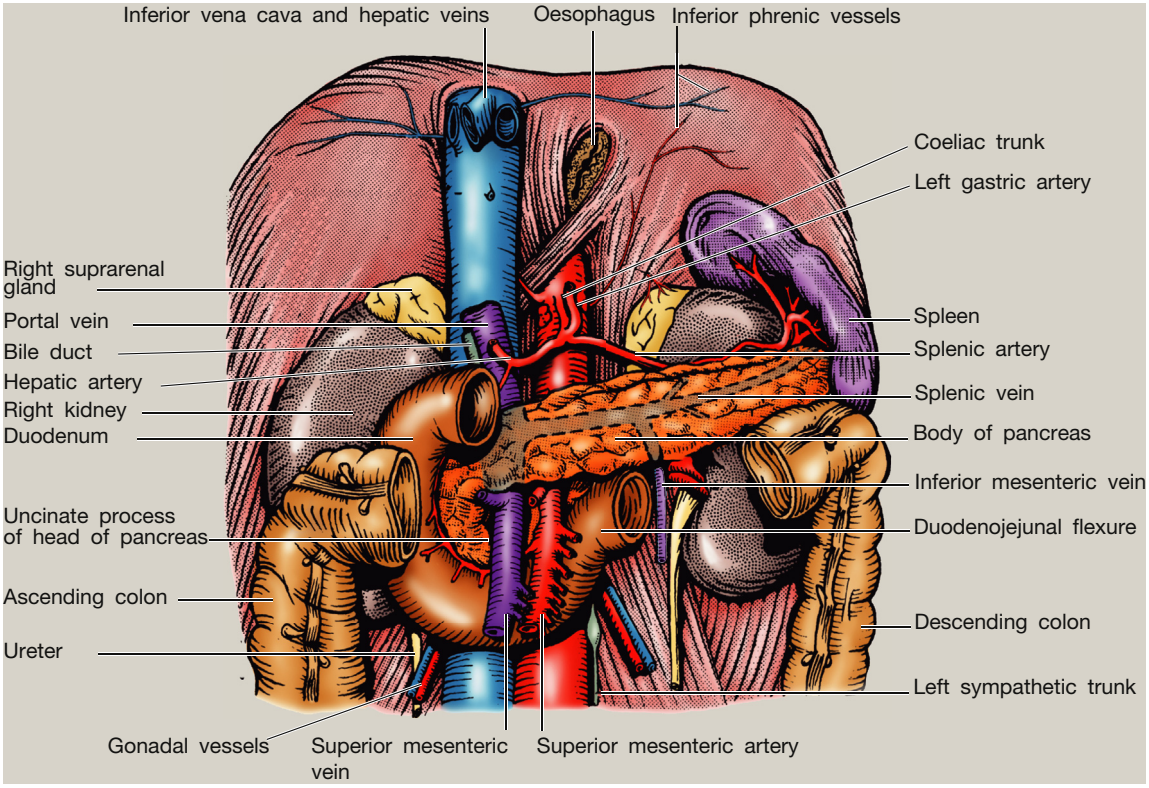


**Figure 1** Topographical relations of the pancreas.

significant devascularization of the duodenum. The body and tail of the pancreas are supplied by multiple branches of the splenic artery. The latter is a major terminal branch of the coeliac trunk. It runs tortuously and to the left, along the upper border of the body and tail of the pancreas (Figure 2) before entering the splenorenal ligament to reach the splenic hilum. The splenic artery gives off multiple branches which enter the dorsal surface of the pancreas (Figure 2).

Venous drainage of the pancreas is to the portal system (Figure 3). The portal vein is formed immediately behind the neck of the pancreas by the confluence of the splenic vein and superior mesenteric vein (Figure 3). The splenic vein, unlike the splenic

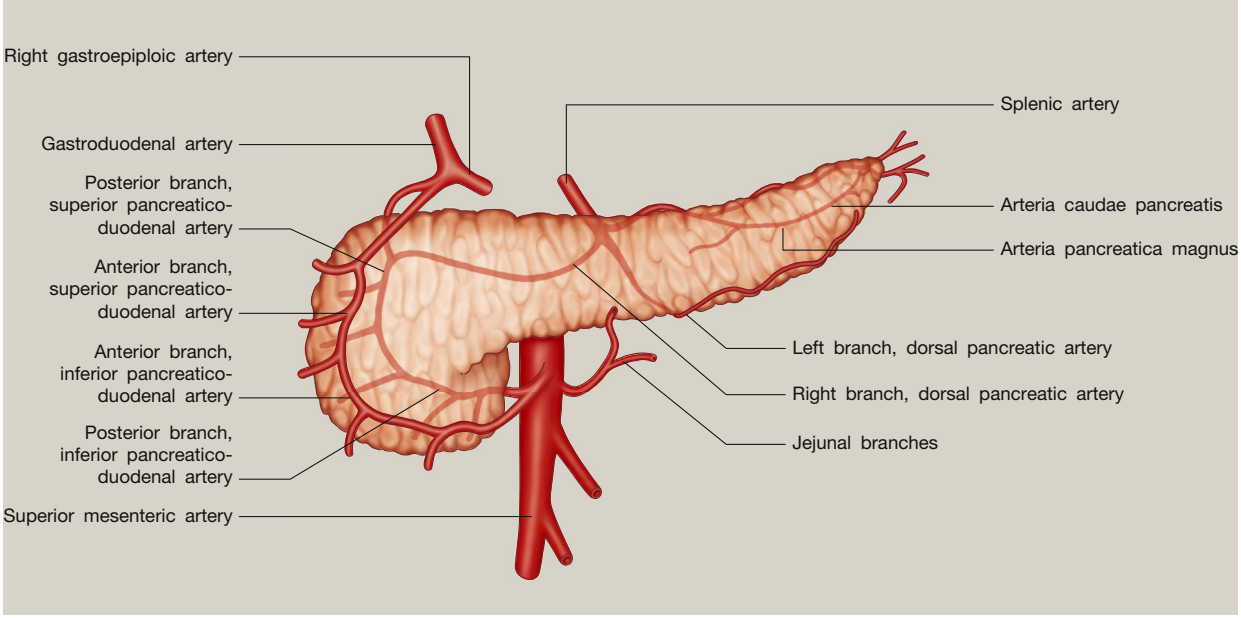


**Figure 2** Arterial supply of pancreas.